a series of shocks began at five minutes after six (Cannes time). "No premonitory warning was given, and there was none of that rumbling noise which frequently accompanies earthquakes. The sky was without a cloud, and the first 'rose of dawn' had just begun to show itself in the east. The air was still and fresh, and not a leaf stirred on mimosa or eucalyptus. The trembling, beginning somewhat gently at first, like that produced by the passage of a heavy railway train, grew rapidly more and more marked. . . . The convulsion lasted for fully a minute, and the oscillation was from east to west. A second but slight shock, some minutes afterwards, did not tend to diminish the apprehension caused by the first. So far as I can learn, few of the thousands who fill the hotels remained in their rooms, the great majority finding their way, some in the scantiest of raiment, into the adjoining gardens. The first alarm was beginning to pass off when, about half-past eight, a third shock was felt. This did not last above fifteen seconds, but while it lasted it was very severe, shaking the floors and moving the furniture in the same way, but in a less degree than the first shock. The air continued calm as before, and the whole sky was flooded with sunshine."

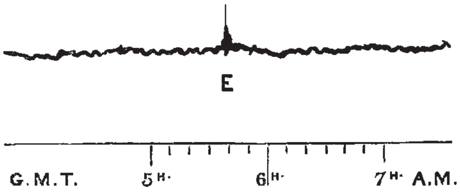
It will be observed that Sir Theodore Martin describes the direction of the oscillation at Cannes as from east to west. Another correspondent of the *Times* says that at Antibes the undulations were "undoubtedly from west to east." At Toulon, where there were two violent shocks about six o'clock, the undulations were also from west to east. On the other hand, at Turin, where there were three shocks in the space of seventeen seconds, the second shock, which was by far the strongest, had a direction from north-east to south-west.

At Marseilles two smart shocks were felt about 6 a.m., and a third at 8.30 a.m. They lasted about fifteen seconds each, and caused fissures in several houses. At Nîmes some windows were shattered, and the clocks stopped; and like results were produced at Grenoble. At Avignon three shocks were felt between 6 and 8 o'clock a.m., and the first shock was violent enough to awake all the inhabitants. Slight shocks were felt at Lyons.

It was in the towns and villages of the Italian Riviera that the earthquake produced its most desolating effects. Diano Marina was utterly destroyed. At the first shock, about 6 o'clock, the inhabitants of this place rushed into the streets half dressed. Then came a more fearful shock. A frightful cracking noise was heard as far as the beach, and the houses fell in, burying the greater number of those who had lived in them. The results at Diano Castello, a mile and a half off, were also very appalling, and at Bajardo more than 200 persons were killed in the church. The full extent of the calamity which so suddenly overtook these and other places in the same district cannot even yet be accurately determined. The following is the official list of dead and wounded:—Alassio, 3 dead, 8 wounded; Albenga, 30 wounded; Albissola, 3 dead, 12 wounded; Bajardo, 230 dead, 30 wounded; Bussano, 80 dead, 27 wounded; Castellaro, 41 dead, 65 wounded; Ceriana, 5 dead, 12 wounded; Diano Castello, 35 dead, 10 wounded; Diano Marina, 180 dead, 65 wounded; Montalto Ligure, 1 dead, 3 wounded; Noli, 16 dead, 12 wounded; Oneglia, 23 dead, about 150 wounded; Pompeiana, 5 dead, 7 wounded; Porto Maurizio, 1 dead, 10 wounded; Savona, 11 dead; Taggia, 8 dead, 14 wounded; Triora, 4 dead, 9 wounded.

All over Switzerland the earthquake was felt, more or less, and the oscillations are said to have been from north to south. Dr. A. Riggenbach, Assistant Astronomer at the Basle Observatory, writes to us that some shocks occurred there. The two clocks of the Basle Observatory, and the two regulators of the public electric dials, the principal astronomical clock of Knoblich, keeping sidereal time, were stopped at 6h. 42m. 50s. a.m. local mean time, or 5h. 34m. 30s. a.m. Greenwich mean time.

Mr. G. M. Whipple, Superintendent of the Kew Observatory, has been good enough to send us a careful tracing, which we reproduce, of the curve given by the bifilar magnetograph at the Kew Observatory, showing that the instrument was affected by the earthquake about 5.40 a.m. Indications of the later shocks were shown on the original photograph, but not with sufficient clearness to enable them to be satisfactorily identified. In the Signal Office at Washington, the Government seismoscope was, on Wednesday morning, disturbed by accurately recorded shocks at 7.33 a.m. This is equivalent to 7.50 a.m. by the standard time of the 75th meridian. If, therefore, these shocks were connected with the earthquakes in Southern Europe, the velocity of their transmission from the Riviera was about 500 miles an hour.



Copy of trace of bifilar magnetograph at the Kew Observatory, Richmond, Surrey, 1887, February 23, 5–7 a.m. Movement produced by earthquake marked E.

The problems connected with the earthquake were discussed at the meeting of the French Academy of Sciences on Monday. M. Mascart stated the contents of a note from M. Fines, of Perpignan, who possesses a magnetometer. A little before the shock his magnetic instruments were shaken by a peculiar jolting motion. At 5.45 a.m. the magnetic registering instruments at the Observatory in the Parc de St. Maur, near Paris, exhibited the same motions. At the Lyons Observatory similar vibrations were observed at 5.55. M. Mascart remarked that these movements were simultaneous. It was not, therefore, an oscillatory movement passing from one point to another with which they had to deal, but a phenomenon which affected a large space simultaneously. He supposed there had been an electric current which had acted on all the instruments placed within its sphere of action. The form of the curves recorded was very distinct from those given by magnetic instruments when affected by storms or auroras. M. Mascart suggested that means might yet be found of predicting the approach of a seismic storm. He added that if the cause of the effects that had been observed was an electric flux, it was easy to understand why their intensity was everywhere nearly the same. A commission was appointed to examine documents which may be transmitted with reference to the earthquakes.

NOTES

A CIRCULAR to Great Britain and the other European States, and to the United States, has been forwarded by the Executive Commissioners of the Melbourne Centennial International Exhibition. The Exhibition will be opened on August 1, 1888, in order to celebrate the centenary of the founding of the colony of New South Wales, and will remain open for six months. The Commission invites the British, foreign, and colonial Governments to participate in the undertaking, and trusts that steps will promptly be taken by them for the completest possible representative display. It is pointed out that the population of Australasia is 3,500,000, that the imports of British goods annually amount in value to 32,000,000*l.*, and that 7700 miles of railway are open for traffic, while over 2000 miles of line are in course of construction. Applications for space must be made before the end of August this year. The Commission desires to make the Exhibition specially interesting in manufacturing processes, machinery, &c., in motion, and objects of manual labour. There will also be a picture gallery lighted by electricity. Further information may be obtained from the Agent-General in London, or from the Executive Commissioners in Melbourne.

Mr. Robert Etheridge, Jun., of the Geological Department of the British Museum, has received the combined appointments of Palæontologist to the Department of Mines, and to the Australian Museum, Sydney, and will shortly proceed to Australia to take up the duties of the two offices. His extensive palæontological knowledge will be much missed in the British Museum.

Some days ago the Medical School of Paris elected M. Brouardel as Dean, in the place of M. Béclard, recently deceased. M. Brouardel is Professor of Forensic Medicine.

On Saturday last Mr. John Morley delivered, in the Egyptian Hall of the Mansion House, the annual address to the students of the London Society for the Extension of University Teaching. His subject was "The Study of Literature," and we need scarcely say that he set forth his ideas with his usual vigour and lucidity. But what did Mr. Morley mean by the following sentence: "I, for one, am not prepared to accept the rather enormous pretensions that are nowadays made sometimes for physical science as the be-all and end-all of education"? By whom are these "rather enormous pretensions" made? Men of science, no doubt, claim for the study of physical science a high place in education; but we have never heard that they feel disposed, on that account, to exclude the study of art and literature.

The University of St. Petersburg lately celebrated its sixty-eighth anniversary. It has 64 professors, 47 fellows, 8 lecturers, and 39 laboratory assistants. There are 2627 students, who are grouped as follows:—For Oriental languages, 87; for law, 1170; for natural science, 426; for mathematics, 618; for history and philology, 224.

We have received the four February sections of "Studies in Microscopical Science," edited by Mr. Arthur C. Cole. The text, which is finely illustrated, relates to Haustoria, the ovary and ova in birds, fatty degeneration of the kidney, and microbes.

Prof. Otto Struve's jubilee was celebrated some days ago at the Pulkowa Observatory. A great number of delegates from learned societies and scientific institutions were present.

The new journal edited by Prof. Grancher is called the *Bulletin Médical*. It appears in Paris twice a week, on Thursdays and Sundays.

In the February number of the Journal of the Anthropological Institute there is an interesting paper by Mr. Bloxam, describing eight specimens of Aroko or symbolic letters, which have actually been used by the tribe of Jebu in West Africa. These Aroko were sent to Mr. R. N. Cust by Mr. J. A. Otonba Payne, Registrar of the Supreme Court at Lagos, who himself belongs to the tribe of Jebu. The paper is carefully illustrated. One of the figures represents a message from a native prince of Jebu, Ode, to his brother residing abroad. It consists of six cowries, all turned in the same direction. The quill of a feather is passed through them from front to back, and the shaft is turned towards the end of the quill and fixed to the side of the cowries. The significance of this symbolic group of objects depends upon the facts that, in the Jebu language, six is "E-fà," from the verb "fà," to draw, and that Africans are in the habit of cleansing their ears with a feather, and look upon it as the only instrument by which this can be effectually done. The meaning is: "By these six cowries I do draw you to myself, and you should also draw closely to me; as by the feather only I can reach to your ears, so I am expecting you to come to me, and hoping to see you immediately."

In the *Rendiconti* of the Reale Istituto Lombardo for January, Count Trevisan de Saint-Léon describes some experiments recently carried out by Dr. Bareggi in Milan, for the purpose of showing that it is possible to ascertain, from the state of the blood, whether persons bitten by animals suspected of rabies, or even undoubtedly mad, have really been infected.

The Reports of the Botanist to the New York Agricultural Experiment Station, Geneva, N.Y., Mr. J. C. Arthur, for 1885 and 1886, furnish an admirable illustration of the value of such State appointments. A large portion of both Reports is occupied with an exhaustive history of the pear-blight (*Micrococcus amylovorus*), which is exceedingly destructive to pear-trees in the Northern United States; proofs that the mischief is caused by the specific Bacterium; and suggestions for a remedy. In addition to this, much information is given with regard to the following diseases, among others: the strawberry-mildew (*Sphærotheca Castagnei*), the plum-leaf fungus (*Septoria cerasina*), the lettuce-rust (*Septoria Lactucæ*), and the lettuce-mildew (*Peronospora gangliformis*). Woodcuts are given of these various fungoid parasites, and a very useful summary is appended of the literature of the pear-blight.

An admirable lecture on "Wrought Iron" was delivered by Mr. J. Starkie Gardner at the Society of Arts on Tuesday, February 22. It is printed in the current number of the Journal of the Society of Arts, with illustrations of the exquisite iron-work in the cathedrals of York, Durham, and Winchester. The general artistic superiority of mediæval ironwork to that of later times Mr. Gardner attributes in part to the fact that in the Middle Ages important work of this kind was intrusted only to smiths who had a special aptitude for it. If such a workman was not forthcoming, the work was either not executed, or was made in the simplest form; whilst, if he were forthcoming, the details at least of the design were left to his own fancy. Mediæval smiths were not fettered by estimate or bound by time, but Mr. Gardner is of opinion that they did their work much more quickly than men do now. Otherwise, he thinks, the intricate designs used in Germany, Spain, and Portugal, for ordinary domestic purposes, could not have been produced at any price which would have suited the occupiers.

At a durbar held at Shillong in connection with the Jubilee rejoicings, Mr. Ward, Chief Commissioner of Assam, reviewed the history of the province during the last fifty years. In that time, he said, its population and settled area had been nearly trebled. The first tea plantation had been started about fifty years ago. There were now nearly 200,000 acres under tea, while the land taken up by planters, although not yet actually planted, amounted to about 400,000 acres. Again, fifty years ago the land revenue of five districts, comprising Assam proper, had been about four and a half lakhs of rupees; it had grown to twenty-six lakhs. Then the journey from Gowhatty to Debrooghur had occupied a month or six weeks; now it took three days.

Much interest has been excited by the announcement that Capt. Conder, of the Palestine Exploration Expedition, has succeeded in deciphering and translating the Hittite inscriptions. Ten principal texts are known, and Capt. Conder claims to have intepreted all of them. Three of his translations, which were published in the *Times* of Saturday last, are invocations to the sun and water gods, and, apparently, to the divinity of the moon. Capt. Conder says that not only the words, but the grammar of the inscriptions, can be shown to belong to a well-known tongue. What this tongue is, we are not to learn for some time.

WE regret to announce the death of Dr. Grothe, Professor at the Polytechnical School at Delft, author of "Mechanical Technology," and an excellent monograph on iron. He was born in Westphalia in 1806, and died on February 10 last.

PROF. HAECKEL, of Jena, has just started on a journey to the East, which will be of some months' duration. He will visit the coast of Asia Minor to continue his investigations of lower marine animals.

LIEUT. QUEDENFELDT has just returned from Morocco to Berlin, bringing with him some valuable collections: an ethnological one, which he has presented to the Anthropological Society, a collection of insects, and a large collection of the implements, tools, and instruments of torture of the Hamadjas tribe.

MESSRS. G. PHILIP AND SON have in the press a revised and enlarged edition of "The Geology of England and Wales," by Horace B. Woodward, F.G.S., of the Geological Survey of England. They will also have ready shortly "Philips' Planisphere of the Stars visible from the Countries situated about 35° south of the Equator" (uniform with "Philips' Planisphere for England"); "Rustic Walking Routes within the Twelve-mile Radius from Charing Cross," containing a field-path map of the district, with geographical description, charts, and directions, by W. R. Evans; and "Philips' Handy Volume Atlas of the World," consisting of sixty-four plates, containing upwards of one hundred maps, printed in colours, with statistical notes on each map.

MESSRS. WHITTAKER AND CO. will publish shortly a second and much enlarged edition of "Magnets and Dynamo-Electric Machines," being the first volume of their "Specialist's Series." For the new edition some revisions in the text have been made, and a preface and a chapter on the latest types of generators have been written by Mr. W. B. Esson.

A FRENCH translation has been published of Cæsar Lumbroso's "Uomo Delinquànti," with a fine series of figures to illustrate the learned author's lectures concerning the anthropological features of the professional criminal.

ADMIRAL TEISSERENC DE BORT has just published a map, showing the distribution of fog on the various parts of the earth. It is based upon observations made at 1600 land stations, and 112,000 marine ones.

IN a Report just issued, Mr. S. W. North, Medical Officer of Health, calls attention to the prevalence of typhoid fever in York during the year 1886. For many years York has been liable to outbreaks of this disease, and the fact will not surprise anyone who reads Mr. North's account of the sanitary conditions of the city.

IN a paper entitled "Ueber die Allgemeine Beugungsfigur in Fernröhren" (Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg, vii^{e}. série, tome xxxiv., No. 5), Hermann Struve remarks that the old problem of the diffraction of light through a circular aperture, the source being in the axis, has been considered by Airy and others, who have given approximate solutions in special cases; but the general solution has only been made feasible by the discovery of Bessel's functions. He accordingly proceeds to develop it by the straightforward methods with which readers of modern analysis are familiar; showing how his solution accords with those previously given for the axis and for the edge of the geometrical shadow. In this latter case he remarks that the illumination is less than one-fourth that which would be obtained by removing the screen. His results are put into a useful numerical form in tables at the end of the paper.

THE last number of the *Bulletin* of the Belgian Natural History Museum contains a summary of ornithological observations made at various stations throughout Belgium during the year 1885. This is quite a novel feature, which, if carried out systematically, promises excellent results, especially as regards the many obscure questions connected with the migrations of birds of passage. The chief stations are Brussels, Hasselt, Carlsburg, and the Ostend and other lighthouses along the coast. The names of the naturalists who undertake to send in reports are given in all cases. These reports contain the name of the bird in three languages—Latin, French, and Flemish or Walloon according to the locality—followed by the dates of arrival and departure, and any other remarks tending to throw light on the habits and movements of the bird. Thus, under *Ciconia alba*, Bechst., *Cicogne blanche*, *Ooievaar* (white stork), we have, from the Nieuport Lighthouse: "Seven seen, June 18, flying westwards; rare on this coast, where they never nest.—Signed, A. Vermorke." The present summary contains 171 such entries, the value of which, when made by competent observers from year to year, ornithologists will not fail to appreciate.

THE latest advices from Honolulu report that the volcano of Mauna Loa is again in eruption, and that all the craters in the vicinity have become active.

IN the December number of the *Mineralogical Magazine*, Prof. Macadam gives the analysis of a sample of talc used in paper-making. This mineral is obtained from New Jersey. It is very largely employed for paper-making in place of China clay (kaolin), and gives, amongst other advantages, a much more pure effluent, fully 90 per cent. being retained in the paper. From its fibrous nature it appears to attach itself to the smaller paper particles, and retain these also. The very high and beautifully smooth glaze of the American papers is largely due to the use of this substance.

IN the *Mittheilungen* of the Zürich Antiquarian Society (Band xxii. Heft 1) will be found a detailed account of the recently-discovered lake-dwelling at Wallishafen, on the Lake of Zürich. The articles found were mainly bronze, but underneath the existing remains appear to be the charred fragments of an earlier dwelling, the remains of which clearly belong to the Stone Age.

A LARGE canoe, belonging to prehistoric times, was lately dragged from the bottom of the River Cher, near Vierzon, and is now in the Museum of the Society of Antiquaries at Bourges. A part of it had been visible for many years at low water, but no one understood what it was until it happened to be seen by M. Beauchard, who at once perceived its real character. When it was brought to land, fragments which had been torn or cut off by peasants were recovered and pieced together. The canoe is in the form of a trough, and is said to have a general resemblance to the ancient boat found some time ago at Brigg, in Lincolnshire. The present specimen has the special characteristic of being closed at both ends by pieces of wood fixed in vertical grooves. This device seems to have been adopted in consequence of the boat having been injured by some accident.

M. GUILMETH, the French traveller, while on a journey in Australia, discovered some bee-hives in a gigantic eucalyptus-tree, of 120 metres in height. The honey was strongly scented with the perfume of the flowers of the tree. Prof. Thomas Karaman has examined it, and believes it to have beneficial medicinal properties.

LIKE the authorities of the National Museum, Washington, the Curators of the Museum of the Academy of Natural Sciences, Philadelphia, complain that they have not nearly room enough for the display of the collections intrusted to their charge. "It is well within the truth," they state in their Report for 1886, "to say that the existing collections, if properly displayed, would completely fill a building of twice the dimensions of the present one. The large and very valuable collections of the Pennsylvania Geological Survey, contained in upwards of 200 cases, still remain in the cellar, boxed, for want of exhibition space. The types of the greater number of the fossil plants described by Lesquereux in his 'Coal Flora of the United States,' probably one of the most valuable collections of fossil plants in the world, have been added to this collection during the year, but, for similar reasons, still remain boxed. The report of the Professor of Ethnology and Archæology indicates that accessions to this department of the Academy's Museum could readily be had were proper exhibition space provided, but that under present conditions the same is impossible. In view of these facts the necessity for an extension to the Academy's building cannot be too strongly insisted upon." The Curators also urge that a fund should be raised for zoo-geographical exploration. The interest derived from 50,000 dollars would, they think, fairly equip an annual expedition to any of the largely-unexplored regions lying about the dominions of the United States, such as Mexico, Central America, the Bahamas, and Labrador.

MR. ARTHUR J. BETHELL has reprinted, with additions and corrections, three articles which lately appeared in the *Field*, on a ride to the Falls of Zambesi. He has added a number of notes which may be of considerable service to men who think of spending some time in hunting in South Africa.

IT was decided some time ago that a number of the Crown diamonds of France should be sold. Others were put aside for the collections of the Paris School of Mines and Museum of Natural History; and these gems were recently given to the delegates appointed by the two Schools. The Regent diamond, a very fine one, will be kept in the Louvre Gallery.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus*), a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Miss E. James; a Three-striped Paradoxure (*Paradoxurus trivirgatus*) from India, presented by Mr. Gerald Callinder; a Common Squirrel (*Sciurus vulgaris*), British, presented by Miss May Honrott; a Scop's Owl (*Scops qui*), captured at sea near Aden, presented by Mr. W. M. Holland; a White-fronted Heron (*Ardea novæ-hollandiæ*) from Australia, presented by Mr. J. B. Dyas; a Stanley Parrakeet (*Platycercus icterotis*) from West Australia, a Burmeister's Cariama (*Chunga burmeisteri*) from South-East Brazil, a Black Sternothere (*Sternothærus niger*) from West Africa, received in exchange; two Smews (*Mergus albellus* ♂ ♀), European, purchased.

OUR ASTRONOMICAL COLUMN

COMET 1887 *b* (BROOKS, JANUARY 22).—The following ephemeris for this object is by Dr. R. Spitaler (*Astr. Nach.* No. 2773).

1887 Berlin midnight	R.A. h. m. s.	Decl. ° ′	Brightness
March 4	3 37 51	51 48·5 N.	1·19
6	3 43 32	49 39·6	1·15
8	3 46 11	47 35·1	1·12
10	3 53 33	45 35·2	1·08
12	3 58 3	43 39·9	1·04
14	4 2 17	41 49·3 N.	1·00

The brightness on January 25 is taken as unity.

COMET 1887 *c* (BARNARD, JANUARY 23).—Dr. H. Oppenheim gives (*Astr. Nach.* No. 2773) the following ephemeris for Berlin midnight for this comet:—

1887	R.A. h. m. s.	Decl. ° ′	log *r*	log Δ	Brightness
March 10	21 36 44	51 59·4 N.	0·3182	0·3700	0·6
14	21 52 56	53 51·0	0·3259	0·3775	0·6
18	22 9 39	55 34·6	0·3335	0·3855	0·5
22	22 26 51	57 10·3	0.3411	0·3938	0·5
26	22 44 30	58 37·8	0·3486	0·4025	0·4
30	23 2 32	59 57·2 N.	0·3560	0·4113	0·4

The brightness at discovery is taken as unity.

COMET 1887 *d* (BARNARD, FEBRUARY 15).—Prof. Boss supplies the following elements and ephemeris for this object from observations made on February 16, 18, and 20:—

$$T = 1887 \text{ April } 6{\cdot}77 \text{ G.M.T.}$$

$$\left.\begin{array}{lrr} \pi = & 203^\circ & 13' \\ \text{☊} = & 139 & 16 \\ \iota = & 126 & 2 \end{array}\right\} \text{Mean Eq. } 1887{\cdot}0$$

$$\log q = 9{\cdot}8892$$

Ephemeris for Greenwich Midnight

1887	R.A. h. m.	Decl. ° ′	Brightness
March 2	3 56·7	29 21 N.	0·38
4	3 40·0	31 18	...
6	3 26·5	32 48 N.	0·32

The brightness at discovery is taken as unity.

A METHOD FOR THE DETERMINATION OF THE CONSTANT OF ABERRATION.—M. Lœwy, in reply to M. Houzeau's claim to be considered the originator of the method for determination of aberration by measurement of the relative positions of two stars situated in distant parts of the sky (NATURE, vol. xxxv. p. 377) points out, in the *Comptes rendus*, tome civ. No. 7, that the invention of a new method for the determination of the constant of aberration does not consist in a general indication of the effect of aberration on a certain observation or combination of observations, but in furnishing definite rules the following out of which will lead to results of the accuracy demanded by the exigencies of modern science. M. Lœwy maintains that M. Houzeau's researches on the subject come under the former category, whilst his own are entitled to be ranked under the latter.

The same number of the *Comptes rendus* contains a note by M. Trépied pointing out how photography can be applied for the purpose of practically carrying out M. Lœwy's method.

THE HARVARD COLLEGE OBSERVATORY.—From Prof. Pickering's Report, presented on December 7, 1886, we learn that during the past year the east equatorial has been used for the photometric observation of the eclipses of Jupiter's satellites upon the system adopted in 1878. The total number of eclipses thus observed is 358, of which 39 have occurred since the end of October 1885. With the same equatorial the observation of comparison stars for variables with the wedge photometer has been continued, and has formed the principal work of the instrument. The "new" stars in Orion and Andromeda, and comets, have also been observed with the east equatorial throughout the year. The reduction and publication of work already done with the meridian-circle is at present, in Prof. Pickering's opinion, more desirable than the prosecution of new series of observations. This department of the Observatory has sustained a heavy loss in the resignation of Prof. Rogers, who has devoted many years to laborious astronomical work at Harvard College. During the year ending November 1, 1886, 209 series of measures have been made with the meridian-photometer. The total number of separate photometric comparisons is 59,800. The instrument continues to give entire satisfaction as a means of measuring the brightness of stars of the ninth magnitude or brighter. The average deviation of 100 circumpolar stars used as standards, which, with the smaller instrument of the same kind employed in the Harvard photometry, was 0·16 of a magnitude, has been reduced to 0·12 with the present instrument; whilst the average deviation of stars from the fifth to the ninth magnitude but little exceeds 0·1 of a magnitude. And a comparison between the results obtained by Dr. Lindemann, at Pulkowa, with a Zöllner photometer, and at Harvard College, with the meridian-photometer, shows that the average deviation of a measurement of the difference in brightness between two stars observed at both places does not exceed 0·1 of a magnitude. For an account of the interesting and import-